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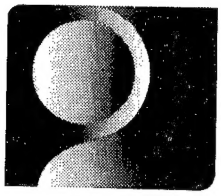
ENERGY SURVEY OF ARMY DINING FACILITIES FORT BRAGG, NC



EXECUTIVE SUMMARY

Contract #DACA21-86-C-0059
April 8, 1988

Final Report Submitted to:

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Marie Wakefield,
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EXECUTIVE SUMMARY

1. Introduction

1.1 Scope of Work

IES Engineers was contracted by the Savannah District of the US Army Corps of Engineers in July 1986 to perform a complete energy audit and analysis of forty-three dining facilities at Fort Bragg, North Carolina. The essential elements of the Scope of Work (SOW) are listed below. The majority of the buildings are permanent structures with a remaining useful life of over 25 years. Five of the buildings are temporary structures which are expected to remain in use for at least ten years.

BRIEF DESCRIPTION OF WORK: The Architect-Engineer (AE) shall:

1. Perform a complete energy Audit and Analysis of the dining facilities.

2. Identify all Energy Conservation Opportunities (ECOs) including low cost/no cost ECOs and perform complete evaluations of each.

3. Prepare programming documentation [DD 1391, Life Cycle Cost Analysis Summary Sheet with backup calculations and Project Development Brochure (PDB)] for any Energy Conservation Investment Program (ECIP) projects.

4. Prepare implementation documentation for all justifiable energy conservation opportunities.

5. List and prioritize all recommended Energy Conservation Opportunities.

6. Prepare a comprehensive report which will document the work accomplisned, the results and recommendations.

The project consisted of detailed audits of twenty dining facilities and "walk-through" audits of the remaining twenty-three buildings. The buildings are listed by number in Table 1-1. Per the SOW, the Building Loads Analysis and Systems Thermodynamics (BLAST) computer program was used to simulate existing energy consumption and to evaluate energy conservation opportunities (ECOs) in the buildings receiving detailed audits. "Walk-through" audits were then performed on the remaining buildings in order to determine which of the previously identified ECOs could be duplicated.

In addition to the energy audits, the SOW also called for the testing of solar domestic hot water systems in buildings C-4122 and H-5718, and ventilation studies in all of the "C" buildings.

Table 1-1. List of Dining Facilities Audited

Buildings Included in Detailed Audit

Building	Sq ft	Building	Sq ft
C-4122	4,850	O-9013	4,800
C-4422	4,850	P-3042	7,857
C-6432	4,850	I-1242	3,168
C-8344	4,850	4-1437	7,500
C-8750	5,050	A-3275	5,608
C-9349	5,050	AT-4622	2,800
C-7236	4,850	AT-4632	2,800
D-2626	11,313	AT-4686	2,800
D-3404	9,346	MT-6115	2,375
H-5718	14,920	8T-3849	13,400

Buildings Receiving Walk-through Audits

Building	Sq ft	Building	Sq ft
C-3020	4,850	C-7433	4,850
C-3027	4,850	C-7634	4,850
C-3321	4,850	C-8339	4,850
C-4120	4,850	C-8541	4,850
C-4125	4,850	C-6726	4,850
C-4424	4,850	C-8438	4,850
C-4426	4,850	D-2105	11,313
C-4428	4,850	D-3039	11,313
C-5528	4,850	D-3055	11,313
C-5725	4,850	H-4842	14,920
C-6525	4,850	2-1105	3,168
		2-1138	3,168

1.2 General Description of the Facilities

Refer to Table 1-1 for a listing of all of the facilities. The "C area" buildings (buildings with the C prefix) are all similar concrete block structures consisting of a dining facility connected to a three story barracks. The barracks portion of each building was not included in the SOW of this study. The buildings are of two types; type 64 and type 121, with the only difference being slight variations in the floor plan.

The "D" buildings are dining facilities serving the "D area barracks". The barracks portion of each building was not included in the SOW of this study. All of the buildings are identical brick and block with the exception of D-3404. The floor plan and interior equipment of building D-3404 is slightly different from the other buildings.

Buildings H-4842 and H-5718 are relatively new dining facilities. The two buildings are similar brick and block buildings with slight variations in floor plans.

Building 0-9013 is a prefabricated metal building which serves as a classroom and dining facility at the Mott Lake Training Center. The classroom portion of the building was not included in the SOW of this study.

Building P-3042 is a concrete block structure which houses a warehouse and dining facility for Simmons Army Airfield. The warehouse portion of the building was not included in the SOW of this study.

Buildings 1-1242, 2-1105, and 2-1138 are three story brick and block structures which serve as military police barracks. Each building houses a kitchen and dining facility on the ground floor. The SOW of this study included only the dining area portion of the building.

Building 4-1437 is a relatively new brick and block structure, half of which serves as a dining facility and the remaining half as storage and offices. The storage and offices are not part of the dining facility and were not included in the SOW of this study.

Buildings AT-4622, AT-4632, and AT-4686 are identical temporary wood frame dining facilities. The buildings have recently been covered with wall insulation and metal siding. Building MT-6115 is similar to these buildings with the only difference being a slight variation in size and the absence of new insulation and metal siding.

Building 8T-3849 is a large temporary wood frame structure serving as a dining facility. One dining room wing of the structure is currently used only periodically as a classroom, but was surveyed under this contract.

1.3 Present Energy Consumption

1.3.1 Total Annual Energy Used

The total estimated energy consumption of the detailed buildings audited,as predicted by the BLAST computer model is shown in Figure 1-1. The total energy cost including demand charges is estimated at $495,716. This assumes completion of all planned or ongoing projects. Figure 1-2 shows the total energy cost by fuel type.

1.3.2 Energy Consumption by Building

Table 1-2 lists the energy consumption and cost by fuel type for all detailed buildings audited. These costs include electric demand costs.

1.4 Energy Conservation Analysis

1.4.1 ECOs Investigated

All of the ECOs shown in the sample checklist (Table 1-3) on the following pages were investigated for each building in the SOW. Similar checklists for each building appear in the respective chapter for that building. A "Yes" means that the ECO seemed feasible in the field and was considered further. All those marked "Yes" are described in this report, although after further analysis some resulted in not being recommended. A "No" on the checklist indicates that the ECO was unfeasible as explained. A comparison of the SOW checklist and each of the building lists will show that many additional ECOs were investigated.

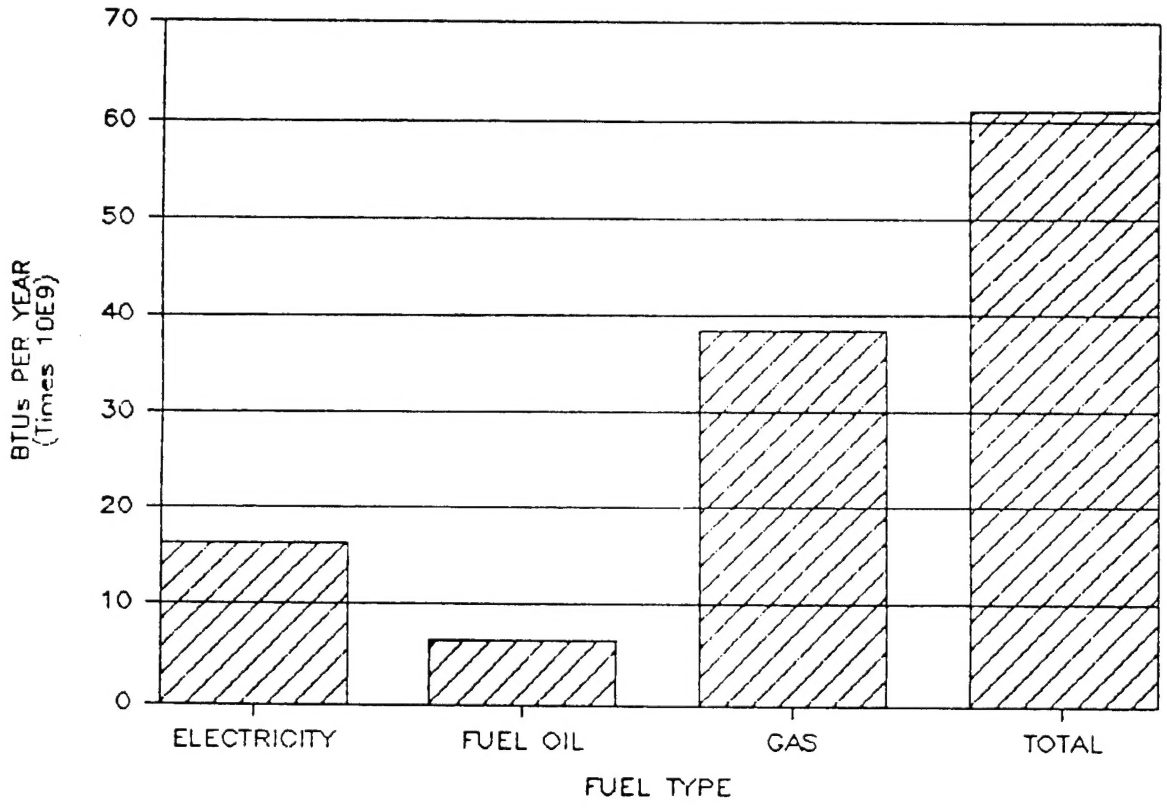
All of the ECOs were evaluated relative to the base case building simulations on BLAST. The BLAST runs were run interactively, i.e., assuming implementation of previously analyzed ECOs. The order of the BLAST runs is shown in Table 1-4. This order is based on the assumption that ECO's which will reduce the load on the HVAC equipment should be implemented before HVAC ECO's are implemented.

1.4.2 ECOs Recommended

Table 1-5 lists all ECOs recommended for the detailed and walk-through buildings in order of SIR. As indicated, the total installed cost is estimated to be $261,975 with a total annual savings of $110,880 for a payback of 2.4 years.

Figure 1-1.

TOTAL ANNUAL ENERGY CONSUMPTION OF DETAILED BUILDINGS
BASED ON BLAST ANALYSIS

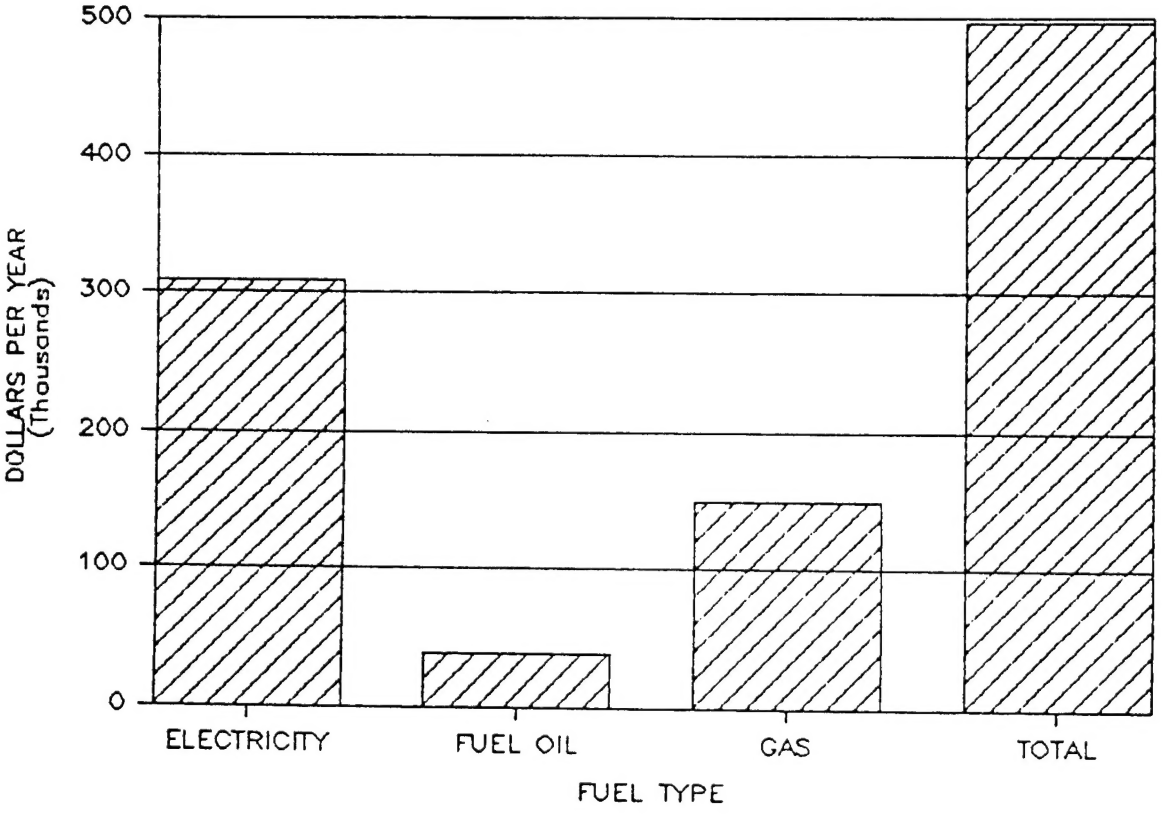


Buildings Included in Detailed Audit

Building	Sq ft	Building	Sq ft
C-4122	4,850	0-9013	4,800
C-4422	4,850	P-3042	7,857
C-6432	4,850	I-1242	3,168
C-8344	4,850	4-1437	7,500
C-8750	5,050	A-3275	5,608
C-9349	5,050	AT-4622	2,800
C-7236	4,850	AT-4632	2,800
D-2626	11,313	AT-4686	2,800
D-3404	9,346	MT-6115	2,375
H-5718	14,920	8T-3849	13,400

Figure 1-2.

CALCULATED ANNUAL ENERGY COST 1987 OF DETAILED BUILDINGS
BASED ON BLAST ANALYSIS



Buildings Included in Detailed Audit

Building	Sq ft	Building	Sq ft
C-4122	4,850	0-9013	4,800
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D-2626	11,313	AT-4686	2,800
D-3404	9,346	MT-6115	2,375
H-5718	14,920	8T-3849	13,400

Table 1-2. Esti ated Building Energy Consumption and Cost

Building	Electricity KWH	KW	MBTU	Cost	Fuel OiL GAL	MBTU	$	GAS THERMS	MBTU	$	TOTAL MBTU	$
C-4122	361236	113.3	1232.9	20244	0	0.0	0	15063	1506.3	5634	2739.2	25877
C-4422	324905	110.4	1108.9	18793	0	0.0	0	18287	1828.7	6839	2937.6	25633
C-6432	343246	112.9	1171.5	19597	0	0.0	0	17541	1754.1	6560	2925.6	26158
C-8344	336947	110.8	1150.0	19230	0	0.0	0	15119	1511.9	5655	2661.9	24884
C-8750	306680	105.8	1046.7	17846	0	0.0	0	19753	1975.3	7388	3022.0	25234
C-9349	311691	106.2	1063.8	18045	0	0.0	0	19686	1968.6	7363	3032.4	25408
C-7236	297158	76.2	1014.2	15481	0	0.0	0	31448	3144.8	11762	4159.0	27243
D-2626	267682	81.4	913.6	14824	0	0.0	0	48679	4867.9	18206	5781.5	33030
D-3404	247612	51.9	845.1	12100	0	0.0	0	29206	2920.6	10923	3765.7	23023
H-5718	761764	217.5	2599.9	41207	0	0.0	0	59887	5988.7	22398	8588.6	63604
O-9013	54439	39.4	185.8	4593	1665	231.0	1365	1651	165.1	617	581.9	6575
P-3042	139672	27.4	476.7	6693	10917	1514.2	8949	12020	1202.0	5289	3192.9	20931
1-1242	212716	106.6	726.0	24147	11576	1605.6	9489	0	0.0	0	2331.6	33637
4-1437	235130	100.0	802.5	23612	0	0.0	0	35371	3537.1	13229	4339.6	36841
A-3275	162028	41.9	553.0	11626	0	0.0	0	17000	1700.0	7480	2253.0	19106
AT-4622	65280	38.3	222.8	8377	0	0.0	0	10282	1028.2	4524	1251.0	12901
AT-4632	63493	37.8	216.7	8242	0	0.0	0	9217	921.7	4055	1138.4	12297
AT-4686	63375	37.8	216.3	8239	0	0.0	0	9671	967.1	4255	1183.4	12494
MT-6115	60973	36.7	208.1	7983	0	0.0	0	9223	922.3	4058	1130.4	12041
8T-3849	162291	39.9	553.9	8337	22433	3111.5	18389	4708	470.8	2072	4136.2	28798
	4778318	1592.5	16308.4	309218	46592	6462.3	38192	383812	38381.2	148306	61151.9	495716

Table 1-3. Sample ECO Checklist

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 1 of 6

ENERGY CONSERVATIUN OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
A. Heating, ventilating, and air conditioning			
1. Night setback/setup, shut off AHUs when possible		X	E EMCS
2. Reduce OA intake when air must be heated or cooled before use.		X	E already at minimum
3. Reduce supply and/or exhaust air flows		X	E already at minimum
4. Shut off/reduce speed of room fan coils		X	NA no fan coil units
5. Shut off/reduce stairwell or vestibule heating		X	NA vestibule not heated
6. Shut off unneeded circulating pumps		X	E no unneeded pumps
∞ 7. Reduce humidification to minimum requirements		X	NA no humidification exists
8. Reduce condenser water temperature		X	NA central chiller plant
9. Cycle fans and pumps		X	E EMCS
10. Reduce pumping flow		X	E already at minimum
11. Maintain authorized temperatures	X		See A-29
12. Use damper controls to shut off air to unoccupied areas		X	NA no unoccupied areas
13. Repair and maintain steam lines and traps		X	E good condition
14. Reset hot and cold deck temperatures based on areas with the greatest need		X	NA single zone system
15. Raise chilled water temperature		X	NA central chiller plant
16. Shed loads during peak electrical use periods		X	No available loads
17. Use OA for dry bulb economizer cycle	X		
18. Reduce reheating of cooled air		X	NA not a reheat system
19. Recover heating/cooling energy with energy recovery units	X		See G-3 and G-4
20. Reduce chilled water circulated during light cooling loads		X	NCE small system

E - existing
NCE - not cost effective
NA - not applicable/does not exist/not appropriate

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 2 of 6

ENERGY CONSERVATION OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
A. Heating, ventilating, and air conditioning (continued)			
21. Install minimum sized motor to meet loads		X	E already minimum size
22. Install infrared heating systems		X	NCE efficient system exists
23. Convert to variable air volume system		X	NCE small system
24. Common manifolding of chillers		X	NA central chiller plant
25. Insulate ducts and piping		X	E insulation exists
26. Eliminate simultaneous heating and cooling		X	E no simultaneous heating and cooling
27. Clean coils	X		See maintenance items
28. Maintain filters	X		See maintenance items
29. Repair and/or maintain AHU controls	X		
30. Water treatment or prevent tube fouling		X	NA central boiler/chiller plant
31. Multispd/variable spd cooling tower fans		X	NA central chiller plant
32. Provide a separate cooling system		X	NA no areas with diff. schedule
33. Provide return air ductwork		X	E system has return ducts
34. Reduce leakage of SA at AHU		X	E does not leak
35. Reduce static pressure		X	E already at minimum
36. Install destratification fans		X	E dining room has ceiling fans
37. Balance airflows		X	E system is balanced
38. Install make-up air systems in kitchen		X	E exhaust has integral make-up
39. Use thermal storage systems		X	NCE small system
40. Shut off exhaust systems when not in use		X	E systems are shut off between meals
41. Install computerized energy monitoring and control system		X	E planned project

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 3 of 6

ENERGY CONSERVATION OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
B. Boiler plant			
1. Reduce steam distribution pressure		X	NA central boiler plant
2. Increase boiler efficiency		X	NA central boiler plant
3. Repair, replace or install condensate return system.		X	NA central boiler plant
4. Insulate boiler and/or piping		X	NA central boiler plant
5. Install boiler economizer		X	NA central boiler plant
6. Install air pre-heater		X	NA central boiler plant
7. Check boiler water chemistry program.		X	NA central boiler plant
8. Clean boiler tubes		X	NA central boiler plant
9. Blowdown controls		X	NA central boiler plant
10. Modify boiler controls		X	NA central boiler plant
11. Install smaller boiler		X	NA central boiler plant
C. Lighting			
1. Shut off lights when not needed		X	E lights are off between meals
2. Reduce lighting levels		X	E already at minimum
3. Revise cleaning schedules		X	E fixtures are clean
4. Convert to energy efficient systems	X		Dining hall

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 4 of 6

ENERGY CONSERVATION OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
D. Building Envelope			
1. Reduce infiltration by caulking and weatherstripping	X		
2. Install double pane windows		X	E double pane windows recently installed
3. Install roof insulation		X	E retrofit insulation installed
4. Install loading dock seals		X	NCE usage too low
5. Install vestibules on entrances		X	E main entrance is through barracks
6. Install solar shading, films, screening, curtains, for blinds		X	E tinted windows
7. Install insulation in walls		X	E planned project
8. Install floor insulation		X	NA floor over hot pipe chase
9. Install plastic strips at personnel entrances		X	NA not practical for kitchen
10. Install insulating panels over windows		X	E top panels are insulated
E. Electrical Equipment			
1. Use emergency generator to reduce peak demand		X	NA no emergency generator
2. Shed/cycle elect loads to reduce peak demand		X	NA no loads which can be cycled
3. Convert to energy efficient motors		X	NCE small motors
4. Improve power factor		X	NA no current penalty charge
5. Shut off electric equipment when not needed		X	E personnel turn off unneeded equipment

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 5 of 6

ENERGY CONSERVATION OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
F. Plumbing			
1. Reduce domestic hot water temperature		X	E already at minimum
2. Repair and/or install water heater and hot water piping insulation		X	E good condition
3. Install flow restrictors		X	NA not practical for kitchen
4. Install faucets which automatically shut off water flow		X	NA not practical for kitchen
5. Decentralize hot water heating		X	NA kitchen uses majority of DHW
6. Use booster heaters on dishwashing equipment	X		Convert to steam
7. Recover heat from hot wastewater	X		
8. Install heat pump water heaters to provide hot water and cool the dining area	X		
9. Improve water heater efficiency		X	E good efficiency
10. Shut off water heater during unoccupied period		X	NA needed for barracks

FACILITY: Fort Bragg, NC

Building No: 4122
Date collected:
IES Inc., Chapel Hill, NC

ENERGY ANALYSIS CHECKLIST, page 6 of 6

ENERGY CONSERVATION OPPORTUNITIES (ECOs)	YES	NO	EXPLANATION
G. Kitchen			
1. Shut off range hood exhaust when possible and install dampers		X	E personnel turn off hoods
2. Shut off equipment and appliances whenever possible		X	E personnel turn off unneeded equipment
3. Recover heat from refrigeration equipment	X		
4. Install exhaust heat recovery systems	X		
5. Install automatic pilot lights		X	Electric equipment
6. Install low temperature chemical rinse dishwashing equipment	X		
7. Optimize kitchen operational procedures		X	E see Chapter 1
8. Operate dishwashers only with full loads		X	E dishwashers used only for full loads
9. Preheat only the equipment that will be used		X	E already done
10. Preheat equipment just before using		X	E already done
11. Avoid use of hot water for dish scraping		X	E used only when necessary
12. Clean refrigeration coils		X	E coils are clean
13. Cook with lids in place		X	E lids are used
14. Thaw frozen food in refrigerated compartments	X		
15. Direct cooling fans away from cooking equipment		X	NA no ceiling fans in kitchen
16. Use kitchen exhaust only when needed		X	E personnel turn off between meals
17. Clean exhaust hood grease filters		X	E filters were clean
18. Provide direct exhaust hood make-up air supply		X	E direct supply exists
19. Match pots to burner size so that pots completely cover burner		X	E large pots are used
20. Steam vegetables in lieu of boiling when possible		X	E steamer is used when possible
21. De-energize booster water heaters at night		X	E units are turned off at night
22. Use microwave cooking equipment in lieu of conventional equipment when possible	X		

Table 1-4. Order of Computer Runs to Account for Interaction

1) base case as observed during field investigation (including planned projects)
2) implement envelope ECOs
3) implement lighting ECOs
4) implement ECOs to miscellaneous equipment
5) implement HVAC ECOs

Table 1-5, Recommended ECOs,Ranked by SIR, All Buildings

ECO AND DESCRIPTION		INSTALLED COST	FIRST YEAR $ SAVINGS ENERGY	FIRST YEAR $ SAVINGS NON-ENERGY	PAYBACK YRS	SIR	ANNUAL SAVINGS ELEC MBTU	ANNUAL SAVINGS GAS MBTU	ANNUAL SAVINGS #2 OIL MBTU
B-8-8T-3849	Clean Boiler Tubes	201	1918	-130	0.1	84.25	0.0	0.0	324.6
A-29-AT-4686	Repair Controls	153	332	0	0.5	23.14	0.0	75.5	0.0
F-6-4-1437	Steam Booster Heater	3506	254	6026	0.6	16.98	113.9	-175.2	0.0
C-4-AT-4622	Fluorescent Lighting	52	53	52	0.5	14.55	8.2	-2.9	0.0
C-4-AT-4632	Fluorescent Lighting	52	51	52	0.5	14.28	8.2	-3.2	0.0
A-1-A-3275	Night Setback Controls	1266.0	1334.0	-37.0	1.0	10.63	20.0	270.0	0.0
F-6-C-4424	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4122	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4120	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-8339	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-3321	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-7433	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-3027	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-6432	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-3020	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-5528	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-8541	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4426	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-8750	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4422	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4125	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-8344	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-4428	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-5725	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-6525	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-9349	Steam Booster Heater	3030	530	2655	1.0	9.18	122.6	-188.7	0.0
F-6-C-7634	Steam Booster Heater	3030	530	2655	1.0	9.17	122.6	-188.7	0.0
D-1-0-9013	Weatherstripping	307	137	0	2.2	8.86	0.0	0.0	23.2
C-4-P-3042	Fluorescent Lighting	90	51	10	1.5	8.57	5.1	0.0	0.0
A-1-0-9013	Night Setback Thermostat	506	274	0	1.8	7.24	0.0	0.0	46.4
C-4-8T-3849	Fluorescent Lighting	104	66	0	1.6	6.46	11.7	0.0	-8.8
D-1-P-3042	Weatherstripping	221	219	0	1.0	4.82	1.0	0.0	35.3
A-1-MT-6115	Night Setback	786	349	-25	2.4	4.28	6.3	67.9	0.0
D-1-C-6726	Weatherstripping	90	65	0	1.4	3.72	1.2	14.1	0.0

Table 1-5, Recommended ECOs,Ranked by SIR, All Buildings (Continued)

ECO AND DESCRIPTION		INSTALLED COST	FIRST YEAR $ SAVINGS ENERGY	FIRST YEAR $ SAVINGS NON-ENERGY	PAYBACK YRS	SIR	ANNUAL SAVINGS ELEC MBTU	ANNUAL SAVINGS GAS MBTU	ANNUAL SAVINGS #2 OIL MBTU
D-1-C-8438	Weatherstripping	90	65	0	1.4	3.72	1.2	14.1	0.0
D-1-C-7236	Weatherstripping	90	65	0	1.4	3.72	1.2	14.1	0.0
D-7-8T-3849	Wall Insulation	1730	669	0	2.6	3.63	-0.6	0.0	114.3
D-1-C-5528	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-4426	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-5725	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
C-4-C-4122	Fluorescent Lighting	2759	580	238	3.4	3.41	65.6	-21.8	0.0
D-1-C-7634	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-4428	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-3020	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-8339	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-6525	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-4424	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-7433	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-4125	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-3321	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-3027	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
D-1-C-4120	Weatherstripping	90	63	0	1.4	3.41	2.9	8.9	0.0
F-2-AT-4622	Insulate Storage Tank	218	64	0	3.4	3.14	0.0	14.6	0.0
C-4-0-9013	Fluorescent Lighting	1341	249	90	4.0	3.02	27.7	0.0	-5.1
G-5-AT-4622	Automatic Pilot Lights	545	156	0	3.5	3.02	0.7	34.2	0.0
B-11-8T-3849	Install Smaller Boiler	6374	2145	-130	3.2	2.99	0.0	0.0	363.0
G-5-AT-4686	Automatic Pilot Lights	545	153	0	3.6	2.96	0.8	33.4	0.0
D-3-8T-3849	Attic Insulation	5052	1551	0	3.3	2.94	-18.0	0.0	293.2
D-1-C-6432	Weatherstripping	90	52	0	1.7	2.93	1.4	10.1	0.0
D-7-MT-6115	Wall Insulation	618	162	0	3.8	2.88	-2.2	40.7	0.0
G-5-MT-6115	Automatic Pilot Lights	545	141	0	3.9	2.69	1.6	29.2	0.0
D-1-C-4122	Weatherstripping	90	47	0	1.9	2.67	1.0	9.8	0.0
C-4-C-3020	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-6525	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-3027	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-7433	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-5725	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0

Table 1-5, Recommended ECOs,Ranked by SIR, All Buildings (Continued)

ECO AND DESCRIPTION		INSTALLED COST	FIRST YEAR $ SAVINGS ENERGY	FIRST YEAR $ SAVINGS NON-ENERGY	PAYBACK YRS	SIR	ANNUAL SAVINGS ELEC MBTU	ANNUAL SAVINGS GAS MBTU	ANNUAL SAVINGS #2 OIL MBTU
C-4-C-3321	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-4120	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-4428	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-8339	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-4125	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-4424	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-7634	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-4426	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
C-4-C-5528	Fluorescent Lighting	2759	371	238	4.5	2.62	41.0	-11.4	0.0
A-17-C-6432	Dry Bulb Economizer	612	180	-16	3.7	2.58	17.9	0.0	0.0
C-4-C-4422	Fluorescent Lighting	2759	300	238	5.1	2.42	31.0	-3.3	0.0
C-4-C-8541	Fluorescent Lighting	2759	293	238	5.2	2.40	30.1	-2.7	0.0
C-4-C-8344	Fluorescent Lighting	2759	293	238	5.2	2.40	30.1	-2.7	0.0
A-17-C-4122	Dry Bulb Economizer	612	167	-16	4.1	2.37	16.6	0.0	0.0
C-4-C-8750	Fluorescent Lighting	3471	310	306	5.6	2.19	32.9	-5.8	0.0
C-4-C-9349	Fluorescent Lighting	3471	307	306	5.7	2.17	32.8	-6.2	0.0
A-17-C-8541	Dry Bulb Economizer	612	153	-16	4.5	2.15	15.2	0.0	0.0
A-17-C-8344	Dry Bulb Economizer	612	153	-16	4.5	2.15	15.2	0.0	0.0
C-4-C-7236	Fluorescent Lighting	2759	232	238	5.9	2.11	24.4	-3.6	0.0
C-4-C-8438	Fluorescent Lighting	2759	232	238	5.9	2.11	24.4	-3.6	0.0
C-4-C-6726	Fluorescent Lighting	2759	232	238	5.9	2.11	24.4	-3.6	0.0
C-4-C-6432	Fluorescent Lighting	2759	233	238	5.9	2.03	26.5	-9.1	0.0
A-17-C-4426	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-3027	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-4428	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-3321	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-7634	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-4120	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-6525	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-5528	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-3020	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-4125	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0

Table 1-5, Recommended ECOs,Ranked by SIR, All Buildings (Continued)

ECO AND DESCRIPTION		INSTALLED COST	FIRST YEAR $ SAVINGS ENERGY	FIRST YEAR $ SAVINGS NON-ENERGY	PAYBACK YRS	SIR	ANNUAL SAVINGS ELEC MBTU	ANNUAL SAVINGS GAS MBTU	ANNUAL SAVINGS #2 OIL MBTU
A-17-C-7433	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-8339	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-5725	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
A-17-C-4424	Dry Bulb Economizer	612	143	-16	4.8	1.99	14.2	0.0	0.0
D-1-C-8344	Weatherstripping	90	32	0	2.8	1.83	0.7	6.7	0.0
D-1-C-8541	Weatherstripping	90	32	0	2.8	1.83	0.7	6.7	0.0
D-1-C-4422	Weatherstripping	90	30	0	3.0	1.75	0.5	6.8	0.0
D-9-8T-3849	Floor Insulation	7469	1329	0	5.6	1.68	-4.4	0.0	232.4
A-17-C-6726	Dry Bulb Economizer	612	123	-16	5.7	1.67	12.2	0.0	0.0
A-17-C-7236	Dry Bulb Economizer	612	123	-16	5.7	1.67	12.2	0.0	0.0
A-17-C-8438	Dry Bulb Economizer	612	123	-16	5.7	1.67	12.2	0.0	0.0
D-1-AT-4686	Weatherstripping	339	103	0	3.3	1.62	0.0	23.5	0.0
D-1-MT-6115	Weatherstripping	441	117	0	3.8	1.42	-0.2	27.0	0.0
D-1-AT-4632	Weatherstripping	339	89	0	3.8	1.40	0.1	20.1	0.0
D-1-8T-3849	Replace Door Weatherstr.	624	177	0	3.5	1.39	0.0	0.0	30.0
D-1-AT-4622	Weatherstripping	339	86	0	3.9	1.34	0.1	19.3	0.0
A-29-C-6432	Repair Controls	2823	291	0	9.7	1.27	16.0	34.8	0.0
D-1-C-9349	Weatherstripping	180	42	0	4.3	1.21	0.7	9.4	0.0
D-1-C-8750	Weatherstripping	180	40	0	4.5	1.16	0.6	9.1	0.0
A-29-H-5718	Repair Controls	1375	163	0	8.4	1.15	16.2	0.0	0.0
A-29-C-3321	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-5725	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-6525	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-3027	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-3020	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-4120	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-8339	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-4125	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-4424	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-4426	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-7433	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-4428	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0

Table 1-5, Recommended ECOs,Ranked by SIR, All Buildings (Continued)

ECO AND DESCRIPTION		INSTALLED COST	FIRST YEAR $ SAVINGS ENERGY	FIRST YEAR $ SAVINGS NON-ENERGY	PAYBACK YRS	SIR	ANNUAL SAVINGS ELEC MBTU	ANNUAL SAVINGS GAS MBTU	ANNUAL SAVINGS #2 OIL MBTU
A-29-C-7634	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-5528	Repair Controls	2823	265	0	10.7	1.12	16.2	27.3	0.0
A-29-C-8750	Repair Controls	2823	254	0	11.1	1.09	14.8	28.1	0.0
A-29-C-4422	Repair Controls	2823	262	0	10.8	1.09	16.8	24.7	0.0
A-29-C-9349	Repair Controls	2926	252	0	11.6	1.04	14.6	27.9	0.0
A-17-C-4422	Dry Bulb Economizer	612	82	-16	9.3	1.02	8.1	0.0	0.0
A-1-8T-3849	Night Setback Controls	11908	1409	-74	8.9	1.01	32.1	0.0	183.6
A-29-C-8344	Repair Controls	2823	245	0	11.5	1.01	16.0	22.3	0.0
A-29-C-8541	Repair Controls	2823	245	0	11.5	1.01	16.0	22.3	0.0
A-29-C-6726	Repair Controls	2823	233	0	12.1	1.00	13.4	26.2	0.0
A-29-C-8438	Repair Controls	2823	233	0	12.1	1.00	13.4	26.2	0.0
A-29-C-7236	Repair Controls	2823	233	0	12.1	1.00	13.4	26.2	0.0
A-29-C-4122	Repair Controls	2823	242	0	11.7	1.00	15.7	22.4	0.0
T O T A L S		261975	3942	67085	3.7		4434.2	-2841.8	1632.1

1.4.3 ECOs Considered but not Recommended

Table 1-6 is a list of typical ECOs which were analyzed but were not found to be cost effective.

Table 1-6. Typical ECOs Not Recommended

ECO	Title	Reason Rejected
F-7	Waste Water Heat Recovery	SIR < 1.0
F-8	Heat Pump Water Heater	SIR < 1.0
G-3	Refrigerant Heat Recovery	SIR < 1.0
G-4	Exhaust Heat Recovery	SIR < 1.0
D-1	Double Pane Replacement Windows	SIR < 1.0
A-32	Replace HVAC System	SIR < 1.0

1.5 Energy and Cost Savings

Table 1-7 summarizes the ECO cost and dollar savings by type of building. As noted, the total cost of implementation is $261,975, with an energy savings of $43,795 and a non-energy savings of $67,085, for a payback of 2.4 years.

Table 1-8 summarizes the total annual energy cost and consumption by fuel type for the detailed buildings before and after energy conservation. Figures 1-3 and 1-4 also show energy cost and consumption before and after energy conservation for the detailed buildings.

Table 1-9 shows the energy consumption and cost per meal and per square foot for the detailed building. The consumption and cost per square foot data was extrapolated to similar walk-thru buildings to form Table 1-10. Figure 1-5 combines the calculated energy cost for the detailed buildings and the extrapolated cost for the walk-thru buildings to show the total energy cost before and after energy conservation.

1.6 Projects Developed

Table 1-11 summarizes the projects developed. Many ECOs listed in the ECO summary table (Table 1-5) have not been programmed; thus the totals for Table 1-9 are less than Table 1-5. These ECOs were not programmed because it was discovered at the Interim Presentation that they have been included in other ongoing projects or are no longer applicable.

Table 1-7, Recommended ECOs, By Building Category

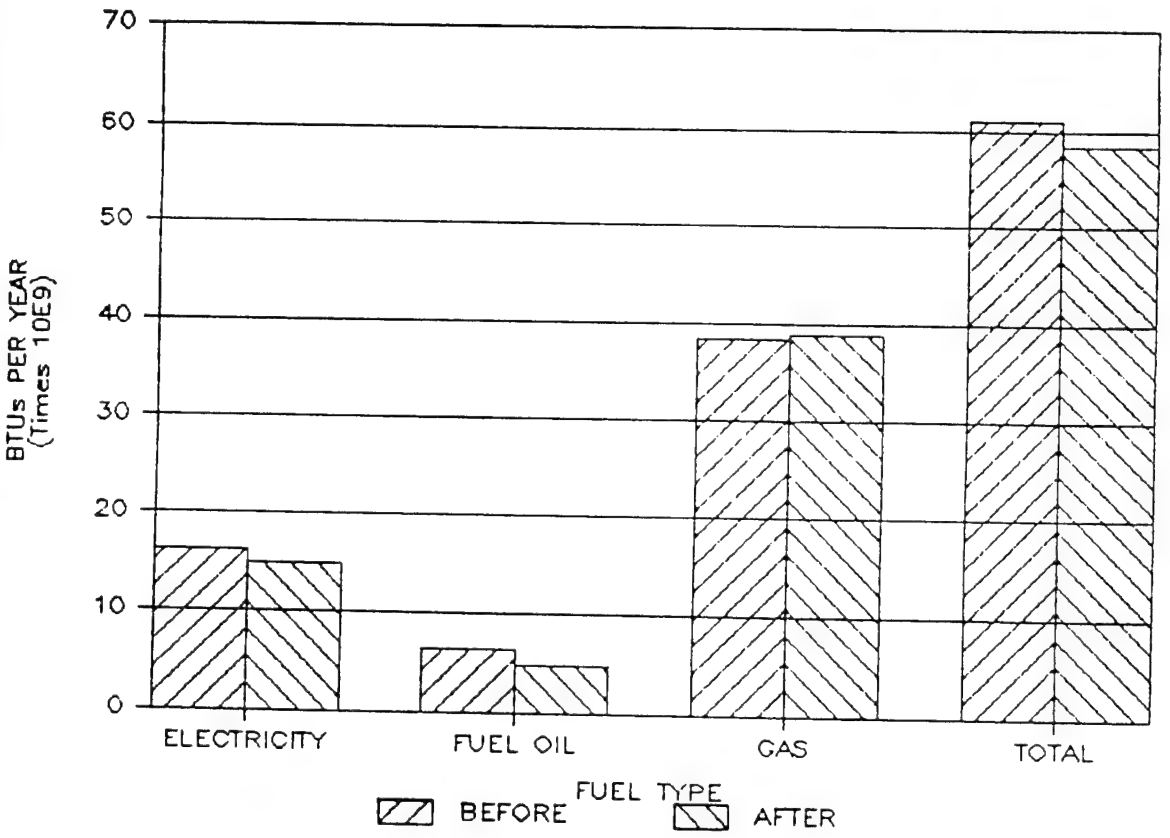
Building Type & Category	INSTALLED COST	$ SAVINGS ENERGY	$ SAVINGS NON-ENERGY	PAYBACK YRS	SAVINGS ELEC MBTU	SAVINGS GAS MBTU	SAVINGS #2 OIL MBTU
Category 1,Type 64, C Buildings	158338	23264	48909	2.2	3342.0	-2786.0	0.0
Category 2,Type 64A, C Buildings	18628	2506	5754	2.3	369.2	-324.8	3264.2
Category 3,Type 121, C Buildings	9504	1134	2961	2.3	170.9	-157.3	0.0
Category 4,Type 121, C Buildings	9607	1131	2961	2.3	170.7	-157.6	0.0
Category 5,Type 64, C Buildings	18852	1959	666	7.2	153.6	110.1	0.0
Category 8, H Buildings	1375	163	0	8.4	16.2	0.0	0.0
Category 9, O Buildings	2154	660	90	2.9	27.7	0.0	64.5
Category 10, P Buildings	311	270	10	1.1	6.1	0.0	35.3
Category 12, (4) Buildings	3506	254	6026	0.6	113.8	-175.2	0.0
Temporary Buildings,Types (AT,MT,8T)	38434	11120	-255	3.5	44.0	379.0	1532.3
Building A-1-A-3275	1266.0	1334.0	-37.0	1.0	20.0	270.0	0.0
T O T A L S	261975	43795	67085	2.4	4434.2	-2841.8	4896.3

Table 1-8. Total Energy Cost and Consumption, Before and After Conservation (Detailed Buildings)

	Before Conservation				After Conservation				
	Gas	Oil	Elec	Total	Gas	Oil	Elec	Total	Total % Reduction
$ Cost	148,306	38,192	309,218	495,716	149,590	28,546	271,590	449,726	10.2
Consumption (MBTUs)	38,381.2	6,462.3	16,308.4	61,151.9	38,839.4	4,830.2	14,917.8	58,587.4	4.4

Figure 1-3.

ENERGY CONSUMPTION BEFORE & AFTER OF DETAILED BUILDINGS

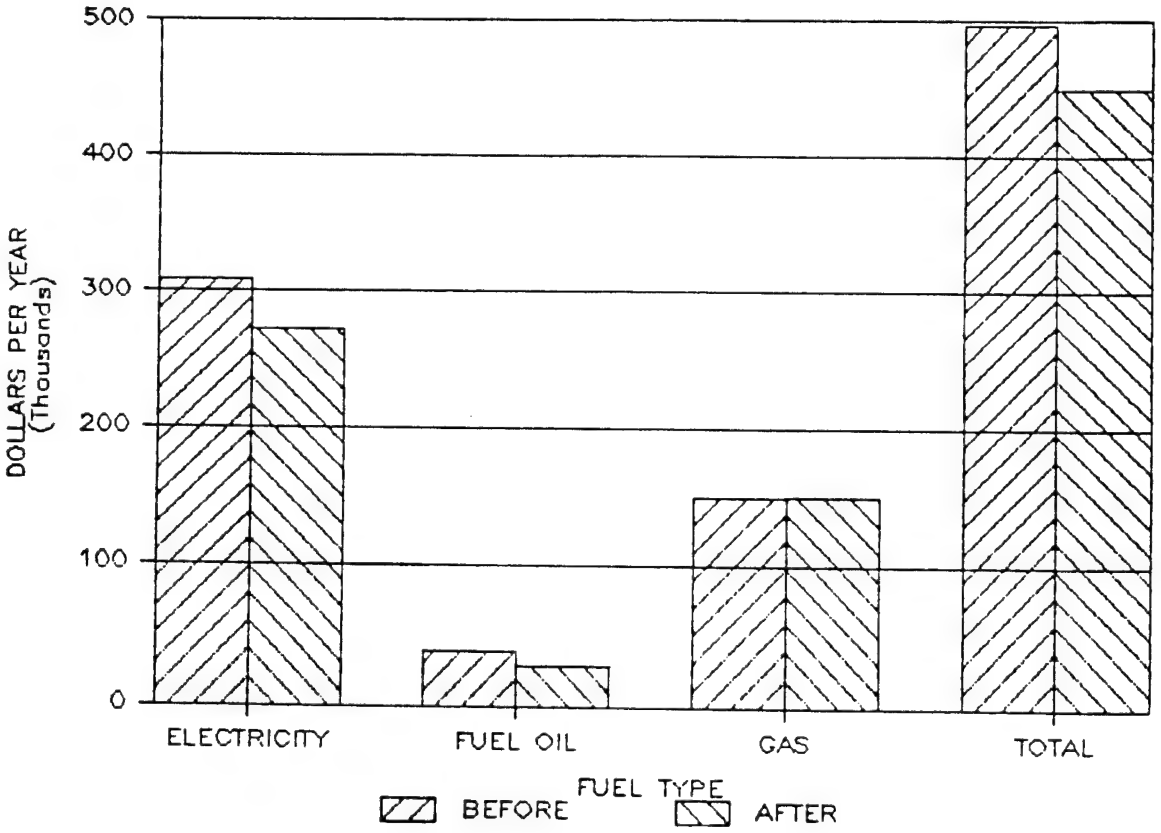


Buildings Included in Detailed Audit

Building	Sq ft	Building	Sq ft
C-4122	4,850	0-9013	4,800
C-4422	4,850	P-3042	7,857
C-6432	4,850	I-1242	3,168
C-8344	4,850	4-1437	7,500
C-8750	5,050	A-3275	5,608
C-9349	5,050	AT-4622	2,800
C-7236	4,850	AT-4632	2,800
D-2626	11,313	AT-4686	2,800
D-3404	9,346	MT-6115	2,375
H-5718	14,920	8T-3849	13,400

Figure 1-4.

ENERGY COST BEFORE & AFTER OF DETAILED BUILDINGS



Buildings Included in Detailed Audit

Building	Sq ft	Building	Sq ft
C-4122	4,850	0-9013	4,800
C-4422	4,850	P-3042	7,857
C-6432	4,850	I-1242	3,168
C-8344	4,850	4-1437	7,500
C-8750	5,050	A-3275	5,608
C-9349	5,050	AT-4622	2,800
C-7236	4,850	AT-4632	2,800
D-2626	11,313	AT-4686	2,800
D-3404	9,346	MT-6115	2,375
H-5718	14,920	8T-3849	13,400

Table 1-9. Energy Summary Data, Detailed Buildings

		BEFORE CONSERVATION							AFTER CONSERVATION					
BUILDING	AREA	MBTU	COST	MEALS/ YEAR	MBTU/ SQ FT	MBTU/ MEAL	COST/ SQ FT	COST/ MEAL	MBTU	COST	MBTU/ SQ FT	MBTU/ MEAL	COST/ SQ FT	COST/ MEAL
C-4122	4,850	2,739.2	$25,877	234,000	0.5648	0.0117	$5.34	$0.11	2,696.0	$21,428	0.5559	0.0115	$4.42	$0.09
C-4422	4,850	2,937.6	$25,633	234,000	0.6057	0.0126	$5.29	$0.11	2,919.1	$21,536	0.6019	0.0125	$4.44	$0.09
C-6432	4,850	2,925.6	$26,158	234,000	0.6032	0.0125	$5.39	$0.11	2,894.1	$21,979	0.5967	0.0124	$4.53	$0.09
C-8344	4,850	2,661.9	$24,884	234,000	0.5488	0.0114	$5.13	$0.11	2,639.7	$20,738	0.5443	0.0113	$4.28	$0.09
C-8750	5,050	3,022.0	$25,234	234,000	0.5984	0.0129	$5.00	$0.11	3,008.4	$21,139	0.5957	0.0129	$4.19	$0.09
C-9349	5,050	3,032.4	$25,408	234,000	0.6005	0.0130	$5.03	$0.11	3,019.3	$21,316	0.5979	0.0129	$4.22	$0.09
C-7236	4,850	4,159.0	$27,243	234,000	0.8575	0.0178	$5.62	$0.12	4,071.1	$26,352	0.8394	0.0174	$5.43	$0.11
D-2626	11,313	5,781.5	$33,030	352,300	0.5110	0.0164	$2.92	$0.09	5,781.5	$33,030	0.5110	0.0164	$2.92	$0.09
D-3404	9,346	3,765.7	$23,023	255,500	0.4029	0.0147	$2.46	$0.09	3,765.7	$23,023	0.4029	0.0147	$2.46	$0.09
H-5718	14,920	8,588.6	$63,604	730,000	0.5756	0.0118	$4.26	$0.09	8,572.4	$63,441	0.5746	0.0117	$4.25	$0.09
O-9013	4,800	581.9	$6,575	16,640	0.1212	0.0350	$1.37	$0.40	489.7	$5,825	0.1020	0.0294	$1.21	$0.35
P-3042	7,857	3,192.9	$20,931	100,375	0.4064	0.0318	$2.66	$0.21	3,151.5	$20,651	0.4011	0.0314	$2.63	$0.21
I-1242	3,168	2,331.6	$33,637	240,900	0.7360	0.0097	$10.62	$0.14	2,331.6	$33,637	0.7360	0.0097	$10.62	$0.14
4-1437	7,500	4,339.6	$36,841	236,600	0.5786	0.0183	$4.91	$0.16	4,400.9	$30,561	0.5868	0.0186	$4.07	$0.13
A-3275	5,608	2,253.0	$19,106	164,250	0.4017	0.0137	$3.41	$0.12	1,963.0	$17,772	0.3500	0.0120	$3.17	$0.11
AT-4622	2,800	1,251.0	$12,901	73,000	0.4468	0.0171	$4.61	$0.18	1,176.8	$12,490	0.4203	0.0161	$4.46	$0.17
AT-4632	2,800	1,138.4	$12,297	73,000	0.4066	0.0156	$4.39	$0.17	1,113.2	$12,105	0.3976	0.0152	$4.32	$0.17
AT-4686	2,800	1,183.4	$12,494	73,000	0.4226	0.0162	$4.46	$0.17	1,050.2	$11,906	0.3751	0.0144	$4.25	$0.16
MT-6115	2,375	1,130.4	$12,041	73,000	0.4760	0.0155	$5.07	$0.16	960.1	$11,272	0.4043	0.0132	$4.75	$0.15
8T-3849	13,400	4,136.2	$28,798	119,600	0.3087	0.0346	$2.15	$0.24	2,583.1	$19,868	0.1928	0.0216	$1.48	$0.17
TOTALS	123,037	61,151.9	$495,715	4,146,165	10.1731	0.3422	$90.09	$2.98	58,587.4	$450,069	9.7862	0.3153	$82.11	$2.68

Table 1-10. Extrapolated Energy Data, Walk-thru Buildings

		BEFORE CONSERVATION				AFTER CONSERVATION			
BUILDING	AREA	MBTU	COST	MBTU/ SQ FT	COST/ SQ FT	MBTU	COST	MBTU/ SQ FT	COST/ SQ FT
C-3020	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-3027	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-3321	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-4120	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-4125	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-4424	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-4426	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-4428	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-5528	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-5725	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-6525	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-7433	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-7634	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-8339	4,850	2,867.5	$25,889	0.5912	$5.34	2,836.4	$21,648	0.5848	$4.46
C-8541	4,850	2,661.9	$24,884	0.5488	$5.13	2,639.7	$20,738	0.5443	$4.28
C-6726	4,850	4,159.0	$27,243	0.8575	$5.62	4,071.1	$26,352	0.8394	$5.43
C-8438	4,850	4,159.0	$27,243	0.8575	$5.62	4,071.1	$26,352	0.8394	$5.43
D-2105	11,313	5,781.5	$33,030	0.5110	$2.92	5,781.5	$33,030	0.5110	$2.92
D-3039	11,313	5,781.5	$33,030	0.5110	$2.92	5,781.5	$33,030	0.5110	$2.92
D-3055	11,313	5,781.5	$33,030	0.5110	$2.92	5,781.5	$33,030	0.5110	$2.92
H-4842	14,920	8,588.6	$63,604	0.5756	$4.26	8,572.4	$63,441	0.5746	$4.25
2-1105	3,168	2,331.6	$33,637	0.7360	$10.62	2,331.6	$33,637	0.7360	$10.62
2-1138	3,168	2,331.6	$33,637	0.7360	$10.62	2,331.6	$33,637	0.7360	$10.62
TOTALS	137,645	81,721.2	$671,789	14.1220	$125.35	81,071.6	$606,314	13.9903	$111.88

Table 1-11. Project Summary Totals

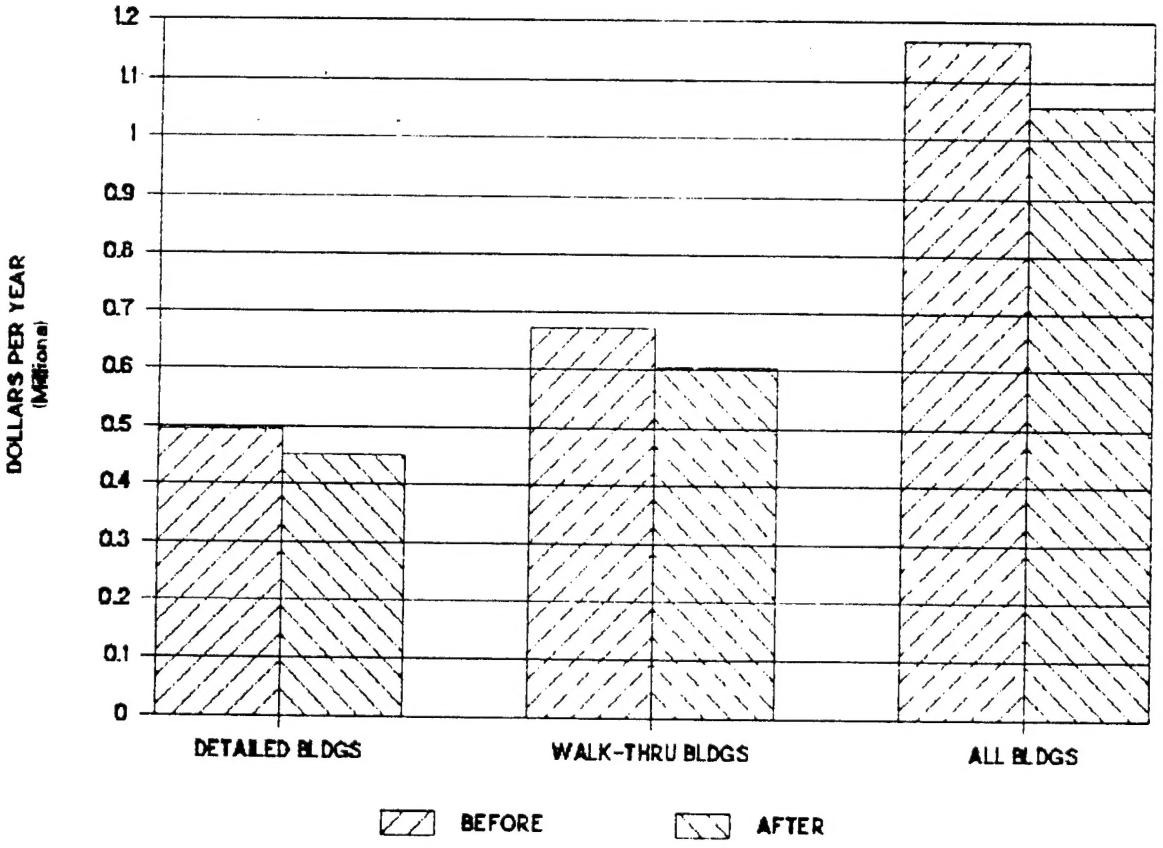
ECO AND DESCRIPTION		TOTAL INSTALLED COST	TOTAL $ SAVINGS ENERGY	TOTAL $ SAVINGS NON-ENERGY	TOTAL PAYBACK YRS	TOTAL SIR	ELEC MBTU	TOTAL SAVINGS GAS MBTU	#2 OIL MBTU
Project # 1	Low Cost/No Cost ECO's	419	1982	-130	0.2	42.02	0.0	14.6	324.6
Project # 2	Install Steam Booster Heaters	67136	11384	61781	0.9	9.18	2688.5	-4137.9	0.0
Project # 3	Weatherstripping	1119	309	0	3.6	1.47	-0.1	70.6	0.0
Project # 4	Wall Insulation	618	162	0	3.8	2.88	-2.2	40.7	0.0
Project # 5	Fluorescent Lighting	69279	8676	6088	4.7	2.55	957.1	-228.1	-13.9
Project # 6	Controls ECO's	2711	2289	-62	1.2	8.49	26.3	413.4	46.4
Project # 7	Dry Bulb Economizers	13464	3106	-352	4.9	1.96	308.4	0.0	0.0
GRAND TOTALS		154746*	27908	67325	1.6		3978.0	-3826.7	357.1

Note: Projects #2-7 are assumed to be implemented in 1989; Project #1 in 1988.

* Does not include ECOs which have been programmed or determined not applicable due to demolition subsequent to the initiation of this study.

Figure 1-5.

ENERGY COST BEFORE & AFTER
(Includes All Buildings)



Notes

1) Data for Detailed Buildings was based on BLAST Analysis.
2) Data for Walk-thru Buildings was extrapolated for similar detailed buildings.

Project #1 consists of Low Cost/No Cost ECOs. These are ECOs which will be completed with DEH funds, scheduled for 1988.

Project #2 has been programmed as a QRIP project for 1989.

Projects #3-7 do not qualify for any of the funding categories listed in the SOW (ECIP, QRIP, PECIP, OSD/PIF). Programming documentation similar to QRIP documents was completed for these projects for 1989, at the request of base personnel. These projects will be funded under other military programs.